Development and Validation of Measures to Study the Effects of the Built Environment on Walking in Hong Kong Older Adults

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Background

- Number of 65+ year olds: 27% of population in 2033
- Health and walking
- Environment and walking
- Most research conducted in low-density urbanized areas of Western countries (Australia; Canada; USA)

- Asian urban areas:
  - Higher density
  - Greater reliance on public transport
  - Socio-cultural differences
  - Differences in the built environment

- Need for valid and reliable exposure and outcome measures for Chinese elders
  - Extant measures developed in Western countries
  - Most measures developed for an adult population (18-65 years)

Aim

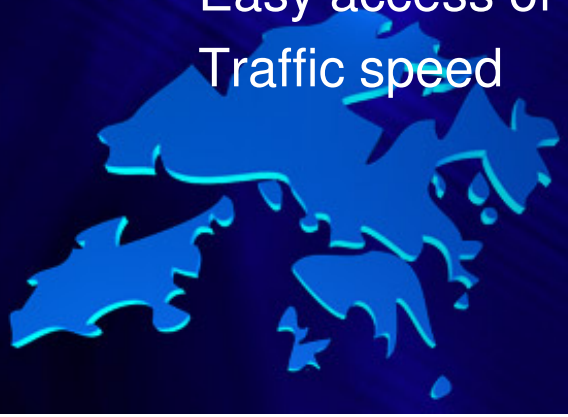
- To develop/adapt and validate interviewer-administered self-report measures of:
  - Perceived neighborhood environmental characteristics related to walking
  - Within- and outside-neighborhood walking

Methods: Instruments

- A questionnaire of perceived environmental factors was developed from the Neighborhood Environment Walkability Scale – Abbreviated (NEWS-A; Cerin et al., 2006)

Residential density
Land use diversity (distance to destinations)
Access to services
Physical barriers to walking
Indoor places for walking
Fence separating footpath and traffic
Bridge/overpass connecting to services
Easy access of residential entrance
Traffic speed

Social disorder / littering
Crime
Street connectivity
Infrastructure for walking
Aesthetics
Presence of people
Crowdedness
Traffic road hazards
Sitting facilities



Methods: Instruments

- A questionnaire on walking behaviour was based on the Neighbourhood Physical Activity Questionnaire (NPAQ – Giles-Corti et al., 2006)
  - Walking for transport within the neighbourhood
  - Walking for recreation within the neighbourhood
  - Walking for transport outside the neighbourhood
  - Walking for recreation outside the neighbourhood
  - Frequently visited destinations

Methods: questionnaire adaptation

- Translation; back-translation
- Adaptation by multidisciplinary panel
  - Physical activity
  - Urban planning
  - Physiotherapy
  - Public health
- Pre-test on 50 Chinese-speaking elders (65+ years), members of the Elderly Health Centres
    - cognitive interviews and randomization to different response scales

Methods:

Participants and procedure:

- N = 484 (aged 65+) – multi-stage stratified sampling strategy
  - Four areas varying in socio-economic status and walkability
    - High SES and high walkability
    - High SES and low walkability
    - Low SES and high walkability
    - Low SES and low walkability
  - 8 residential blocks per area; 15 participants per residential block

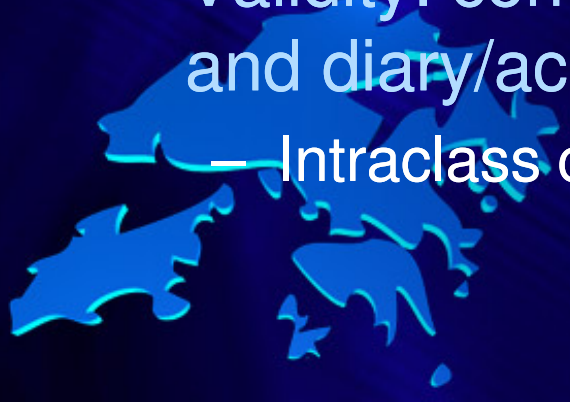
- N=94 for reliability study – balanced by selected residential blocks; wore an accelerometer and kept diary of walks; completed questionnaires twice (14-20 day apart)

- Environmental audits of neighbourhoods (400m radial buffers) using a validated tool

Walkability (GIS) = dwelling density + street connectivity

Methods: Analyses

- Factorial validity of the NEWS-CS (perceived neighbourhood environment)
  - Confirmatory factor analysis
- Reliability of NEWS-CS and Walking questionnaire
  - Intraclass correlation coefficients, % agreement, Kappa statistics
- Validity: correspondence between perceived and objectively measured neighbourhood environmental characteristics
  - Regression analysis with robust standard errors
- Validity: correspondence between walking questionnaire and diary/accelerometer measures
  - Intraclass correlation coefficients



Results

- Factorial validity of the NEWS-CS (perceived neighbourhood environment)
  - 13- inter-correlated factors and 4 single items
  - Good fit (CFI: 0.90; SRMR: 0.058; RMSEA: 0.041)
  - Measurement model comparable to those of international studies

- Reliability of NEWS-CS
  - Acceptable (ICC>0.50 or % agreement>60 for items with low variability) for all items/subscales except for:
    - Distance to video/audio shop, Western non-fast food restaurant, Western coffee shop and public toilet

Results

- Validity: correspondence between perceived and objectively measured neighbourhood environmental characteristics (associations)

Attribute	*r*	Attribute	*r*
Residential density	0.23[b]	Aesthetics	0.16[b]
Land-use mix - diversity	0.16[b]	Social disorder / litter	0.06
Access to services	0.07	Presence of people	0.06
Physical barriers to walking	0.25[b]	Crime	0.14[a]
Street connectivity	0.02	Fence separating traffic from footpath	0.13[a]
Human and motorized traffic	0.39[b]	Bridge/overpass connecting to services	0.22[b]
Infrastructure for walking	0.11[a]	Sitting facilities	0.29[b]
Indoor places for walking	0.19[b]		

Results

- Reliability of Walking questionnaire
  - Moderate to excellent test-retest reliability for items gauging frequent destinations (Kappa: 0.42 to 0.78; % agreement: 69% to 100%)
  - Acceptable (ICC>0.50 or % agreement>60% for items with low variability) for all items but walking for transport outside the neighbourhood (ICC: 0.37)

Results

- Validity: correspondence between walking questionnaire and diary/accelerometer measures

Type of walking	Minutes of walking mean (SD) Questionnaire	Minutes of walking mean SD Diary/accelerometer	ICC
Transport – within neigh'	269 (254)	275 (166)	0.52
Transport – outside neigh'	60 (150)	95 (95)	0.35
Recreation – within neigh'	261 (250)	250 (179)	0.60
Recreation – outside neigh'	57 (143)	49 (105)	0.77

Conclusions

- The NEWS-CS and Walking questionnaire are sufficiently reliable and valid instruments of perceived neighbourhood walkability and walking behaviour, respectively, suitable for Hong Kong senior residents
- The newly developed instruments can be used to identify aspects of the built environment that affect the walking behaviour and, consequently, health of Chinese-speaking older adults living in Hong Kong
- Results from this research line will inform public health and land-use policies and practices for the creation of age friendly cities.

Thank You!

Questions?